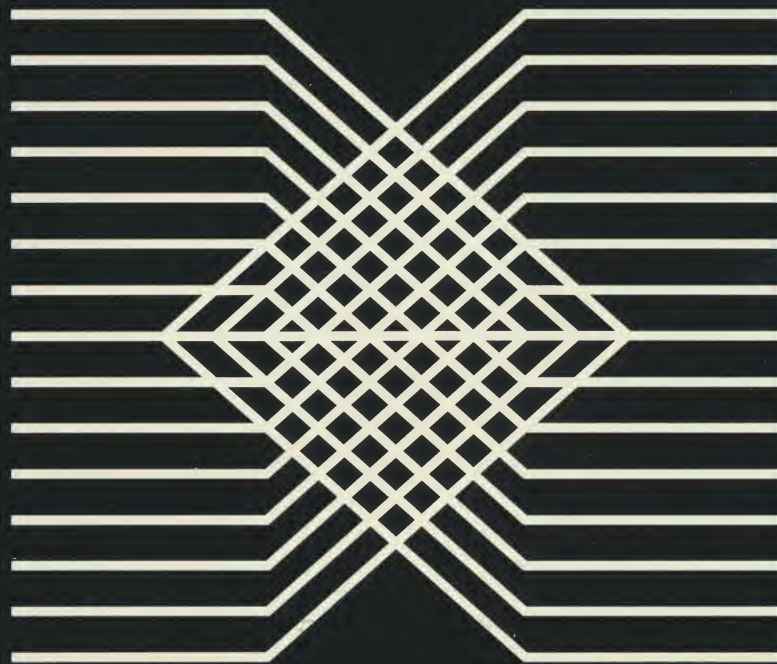


time-sharing

A MANAGEMENT LOOK AT
CONTROL DATA® 3300/3500





TIME SHARING: A MANAGEMENT REVIEW

Because time-sharing doesn't show in pictures, Control Data's 3300 system looks very much like the other trimly designed members of the company's 3000 Series. The 3300, however, has time-sharing agility like no other member of the series except its bigger brother, the 3500. And the 3300 has more power-per-dollar than any other medium-priced time-sharing system on the market. Besides, as in the past, Control Data delivers: The 3300 is already being sold for practically immediate delivery.

In computer circles, the talk of today is time-sharing. In management circles, what does it mean?

Time-sharing means saving money. It means reducing your overall day-to-day costs for computation and data processing. And with Control Data's new ready-for-delivery 3300 system, it means you can start right away.

NEW ROUTE TO LOWER DATA-COSTS

Lease and purchase costs for computer systems, as you know, have continued to come down through the years. Still, a powerful computer, as you also know, continues to represent a major investment. So the best way now to bring down your costs for data processing and computation is to get the most out of your investment after you've made it. That's what time-sharing does for you.

And now a truly powerful, medium priced time-sharing system has hit the market. It's Control Data's 3300.

The 3300 is faster and more powerful than any other time-sharing system in the medium-priced range. It costs less. And it's ready now. Ready to be delivered and to introduce the new efficiency of time-sharing into your data handling procedures.

TIME-SHARING ENDS WAITING

Best way to reduce many operating costs is to let people and machines get on with their work. There's no value in idle waiting. And waiting for data processing is what time-sharing at last eliminates.

Until time-sharing came along, each job for a computer system was handled by itself, one at a time and one after another. For scientific or engineering jobs primarily involving computation, the input and output equipment often stood idle while the central processor was at work. Conversely, with data-handling for business, involving relatively little computation, the all-electronic central processor had to waste time, waiting, while raw data was run into its core by slower, motor-driven magnetic tapes, discs

and/or drums. Then, after processing was carried out, more time was lost while the processor waited for memory to transfer data back to magnetic devices and to paper, through mechanical printers. Even when processing, the core's storage capacity was rarely, if ever, used to full advantage.

Time-sharing ends that waiting and that waste of core-space.

BREAK IT UP INTO PIECEWORK

Now, with today's time-sharing numerous jobs are fed into the processing core at once. The jobs are divided into "pages"—2,048 words to a page. And in Control Data's 3300, the pages can be divided again into halves or quarters, providing new flexibility in handling short programs or the ends of longer ones. Thus the 3300's processor, with core-space for 262,144 words of data, is divided into small, usable units. Easy to load and unload.

When any page or partial page has been processed and can be removed from the core, instructions or data from a new page-divided job are immediately fed into its place. A job doesn't have to stay together as a continuous unit within memory. Instead, page units can go in immediately, wherever space is available, and each is automatically given a "logical address" so that it can be instantly found for processing. This is called "dynamic allocation."

Dynamic allocation results in keeping the processor's core more nearly full all the time. It means that the processor always has work ready to do. Immediately.

And the channels to and from the core don't stand idle, either. In the 3300, there can be as many as eight channels between the core and its peripheral storage units. Quarter-page allocation permits keeping *them* busy, too.

It's this combination of large core-capacity with numerous, fast input/output channels and with Control Data's exclusive quarter-page time-sharing technique that puts the 3300 so far out ahead.



PUTS PEOPLE AHEAD

Because of this time-sharing construction, the 3300 is a job-hungry system. And job-hungry computer systems make for job-happy users. When the system is freed from waiting, its users are spared from waiting, too. Until today, among people who rely on electronics to do their figuring and handle their data, a familiar expression has been "... when I can get some time on the computer ..." With the time-sharing 3300, *when* becomes *now*.

Remember that a modern computer's processor does its actual computing or processing in very small fractions of a second. In this medium-speed range, a few millionths are enough. So if a processor isn't kept waiting for large batches of data to come in or go out, it can handle lots of people's jobs almost simultaneously. With time-sharing, the 3300 does precisely that. Now, thanks to time-sharing, split seconds really count.

The 3300 is a computer of "multi's." Multi-programming. Multi-processing. Multiple access. They all add up to one thing: many different jobs coming into the processor-core, being processed, and being delivered back to many different computer users, all at once. Each user can enjoy the impression that he has a computer all to himself.

BUILT-IN BUSINESS

Most computer systems are designed for maximum versatility—adaptability to business processing and to scientific computation. Still, most computers, like most humans, are better at one type of job than at another. In Control Data's 3300, however, you have a system which sets new standards for competence in both directions at once.

The reason for this two-way leadership is an optional two-way approach to system-configuration. The system you acquire is tailored to the needs of your business/scientific mix.

To begin with, the 3300 has all the capacity for scientific/engineering computation that has made Control Data systems internation-

ally famous. In addition, its hardware and COBOL program handle "business as usual" with speed and effectiveness. Business data handling and scientific computation share time ideally, because the former makes primary use of input/output devices while the latter relies most heavily on the central processor. So if you need computation more than business processing, your total need may well be taken care of by the basic equipment.

But the 3300 has an ace up its sleeve. If you have large-scale business problems, there's a special Business Data Processing Unit to increase your throughput for this type of work. Like an overload specialist in business procedures, it relieves the central processor of time-consuming activity. The result is speed and flexibility increased well beyond even the capabilities of the basic 3300.

AN EXAMPLE

Suppose, for example, that your 3300 system is handling your organization's payroll, doing the usual computations and printing results onto checks. While this is being done, one—or several—of your scientists or engineers may want the 3300 to solve some equations for them. With time-sharing, they needn't wait for the payroll job to be finished.

They use language that is oriented directly to their problems, tapping them out on a keyboard right in their area—at their own desks, if warranted. And the problems go by cable or phone-lines to the 3300.

There, they can go directly into areas of the core not being used for payroll processing. Then during the instants in the payroll job when the processor would otherwise be idle, the equations can be solved, and the solutions transmitted back to the remote stations. This whole sequence may take only a second or two, yet hundreds of thousands of calculations may have been performed with no delay in the completion of the payroll.

That's time-sharing for you. It's the 3300.

ASSIST FROM SOFTWARE

The system-design of the CONTROL DATA 3300 and of its hardware modules is, of course, crucial to its outstanding success as a time-sharing computer. Modules such as the optional Business Data Processing Unit and a Floating Point Arithmetic Unit are valuable for their special purposes. Such hardware can be just what you need. But don't forget software as well. Control Data never does.

The complete software being provided for the 3300 shares honors with the hardware for the system's overall superior performance. Special programs are essential to a truly effective time-sharing system.

A notable example of these programs is Real Time SCOPE, the program which permits the 3300 to carry out on-line control. While time-sharing your other needs with its left hand, the 3300 offers you real-time control with its right. Industry's process-control, medicine's bio-monitoring—whatever your need for control time-shared with other computer functions, it is probably within the 3300's Real-Time SCOPE.

Another program essential to the 3300's overall abilities is MSIO — Mass Storage Input/Output. It's easy enough to say how those 512-word quarter-pages are popped into core-storage for ready availability when the processor wants them to work on. But they have to be labeled, accounted for, and later properly filed on magnetic drums or disks. These mass storage devices contain not one, two or three jobs-worth of data, but great arrays of data and programs of instructions which must be readily available at a level of accessibility second only to that of the core itself. This library-science work carried out by MSIO is especially important in a system like the 3300 which is doing so much work at once.

GUARDING THE GOODS

One other aspect of any time-sharing system demands mention: memory protection.

When so many programs are simultaneously sharing a computer's core and its peripheral devices, it is essential to give them full protection from each other. The 3300 provides such protection with an exceptional degree of security.

Again, success is due both to hardware and software. An expanded hardware interrupt system provides part of the 3300's time-sharing effectiveness. This includes an "illegal write interrupt" which prevents introducing data into protected areas of memory and a "privileged" set of executive instructions which prevents any user from erroneously altering the programs or data basic to the system's operation. Similarly, a function of the MSIO software program is protection of programs and data on mass storage devices. In short, the 3300 provides you with every precaution to make your time-shared, page-divided programs and data as safe as an old-fashioned batch.

ADD IT ALL UP

Your direct concern with the system probably stops here. If you want to hear more, your own data-processing experts can enlighten you from the detailed literature available.

The thing to remember here is the big picture: a computer system to improve service and reduce costs. Here's Control Data's 3300, a medium-priced computer system, with a new partial-page technique of time-sharing. Its well designed hardware is fully documented with manuals and implemented with software. The whole provides more speed and capacity than any competitive system available now or announced for the immediate future. And its price is lower than theirs.

That's the 3300, a computer ready for delivery now. For introducing time-sharing to your own organization. For getting far better use from your computer investment.

CONTROL DATA 3300, the time-sharing system. A number and name to remember.



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